



**Exponent**<sup>®</sup>  
Engineering & Scientific Consulting

## Simon Lockyer-Bratton, Ph.D., P.E., CRE

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### Professional Profile

Dr. Lockyer-Bratton specializes in combining materials science and mechanical engineering principles to perform failure analyses and risk assessments. His specific expertise includes fracture and fractography of glass and ceramics, metallurgical analysis, reliability engineering, mechanical testing, life prediction, and design.

Dr. Lockyer-Bratton has performed numerous failure analysis investigations of metals, glasses, ceramics, and plastics in a wide variety of components, devices and equipment. He has special expertise in fractography and fracture mechanics analyses with an emphasis on components composed of glass, ceramics and other brittle materials. Other key areas of investigation include: automotive, aerospace, building and construction materials, commercial and residential plumbing, consumer electronics, food and beverage packaging, and oil and gas pipelines. He routinely leverages his extensive knowledge in both materials science and mechanical engineering to solve complex multi-disciplinary problems. Dr. Lockyer-Bratton is skilled in optical microscopy, scanning electron microscopy, x-ray diffraction, microhardness, nanoindentation, fracture testing, and novel mechanical testing techniques.

Prior to joining Exponent, Dr. Lockyer-Bratton completed his Ph.D. dissertation work at Johns Hopkins University, where he examined the interfacial fracture behavior of high temperature thermal barrier coatings (TBCs) used in jet engine turbines. He used both mechanical tests and microscopy techniques to investigate microstructural and chemical changes in TBCs during thermal aging. He incorporated experimental results into computational models (finite element analysis) to understand the effect of crack face friction and roughness on TBC interfacial fracture toughness. Dr. Lockyer-Bratton also designed and fabricated several high temperature furnaces (>1200 °C) to conduct non-contact measurements of the coefficient of thermal expansion (CTE) of TBC bond coat materials, utilizing digital image correlation (DIC).

### Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Johns Hopkins University, 2016

M.S.E., Mechanical Engineering, Johns Hopkins University, 2012

B.S.E., Mechanical Engineering, Northern Arizona University, 2011

Whiting School Doctoral Fellowship, Johns Hopkins University

Mechanical Engineering Departmental Fellowship, Johns Hopkins University

## Licenses and Certifications

Licensed Professional Mechanical Engineer, California #39130

Certified Reliability Engineer (CRE), #34785

Certified Risk-Based Inspection Professional (API-580), #86338

## Professional Affiliations

American Ceramics Society (member)

The American Society of Mechanical Engineers (member)

ASM International (formerly American Society for Metals) (member)

## Publications

Lockyer-Bratton S, Ryan M, Louie MW, Rosenfeld M, Veloo P, Rovella T. Nondestructive Examination Protocols for MAOP Verification of Station Pipe. The 31st International Pipeline Pigging and Integrity Management Conference (PPIM), Houston, TX, USA 2019.

Ryan M, Lockyer-Bratton S, Rosenfeld M, Veloo P, Rovella T. MAOP Verification of Gas Transmission Station Piping. Unpiggable Pipeline Solutions Forum, Houston, TX, USA 2019.

## Presentations

Lockyer-Bratton S, Ryan M, Louie MW, Rosenfeld M, Veloo P, Rovella T. Nondestructive Examination Protocols for MAOP Verification of Station Pipe. The 31st International Pipeline Pigging and Integrity Management Conference (PPIM), February 2019.

Lockyer-Bratton S, El-Awady J, Hemker KJ. Experimental measurements of thermal barrier coating interfacial fracture toughness as a function of mode-mix. International Conference on Metallurgical Coatings and Thin Films (ICMCTF), April 2016.

Lockyer-Bratton S, El-Awady J, Hemker KJ. Experimental measurements of coating interfacial fracture toughness as a function of mode-mix. The Minerals, Metals and Materials Society (TMS), March 2015.

Lockyer-Bratton S, El-Awady J, Hemker KJ. Determination of the mode II interfacial fracture toughness of thermal barrier coatings with the compression edge-delamination test. The Minerals, Metals and Materials Society (TMS), February 2014.

## Project Experience

### Glass and Ceramics

Dr. Lockyer-Bratton has conducted dozens of failure analysis investigations involving glass and ceramic materials. Specific examples include:

- Automotive Glass: Analyzed alleged fractures in panoramic sunroof tempered glass. Field returns were examined to determine the causes of these fractures.
- Ceramic Bakeware: Conducted failure analysis investigations of fractures in ceramic bakeware.
- Consumer Glassware: Investigated numerous consumer glassware product fractures. Advised companies on potential recalls involving the possibility of injuries due to glass in food or beverages.

- Glass Bottles: Investigated instances of glass chips due to non-conforming molding of glass beer bottles in the neck area. Conducted field audits to determine likelihood of glass particle contamination in packaged glass wine bottles held in inventory stock.
- Glass LCD Displays: Analyzed the fracture of numerous glass LCD displays in smartphones and other electronic devices. Glass Pressure Vessel Liners: Conducted failure analysis investigation of pressure vessel glass lining fracture and delamination. Conducted testing to determine the extent of glass lining damage.
- Shower Enclosures: Investigated the cause of alleged spontaneous fracture in shower enclosure glass.
- Toilets: Analyzed ceramic toilet breakages to identify the root cause of fracture.

### **Consumer Electronics**

Dr. Lockyer-Bratton has conducted numerous failure analysis investigations of consumer electronics products.

- Conducted failure analysis investigations of components found in consumer electronics such as glass display panels, silicon chips, thin film coatings, and various metallic and polymer components.
- Developed and conducted novel mechanical tests to measure the vendor-to-vendor performance of components directly on devices, where removal of components is not feasible.

### **Construction and Building Materials**

Dr. Lockyer-Bratton has investigated failures of construction and building materials. Specific examples include:

- Architectural Glass: Analyzed fracture of architectural glass windows and glass railings. Investigated the performance of architectural glass channels with respect to glass breakage.
- Insulated Glass Units: Investigated instances of fogging and other malfunctions in insulated glass units (IGUs).
- PVC Plastic Pipes: Analyzed fractures of PVC pipes, including natural gas distribution lines and residential fire system lines.
- Vinyl Siding: Investigated claims of alleged premature failure of residential vinyl siding materials.

### **Oil & Gas**

Dr. Lockyer-Bratton has performed numerous investigations relating to oil and gas pipelines. Some examples of this work are:

- Fitness-for-Service: Conducted numerous fitness-for-service assessments to determine whether piping components that contain flaws, have sustained damage, or have age related degradation are fit for continued service. Well versed in API 579/ASME FFS-1 and BS 7910 standards.
- Hydrotest Failure Analysis: Conducted investigations to determine the cause of rupture for oil and gas pipelines that ruptured during hydrotesting.
- Pipeline Integrity Management: Worked directly with gas suppliers to assess and make change recommendations for pipeline integrity management plans.
- Root Cause Analysis: Conducted numerous root cause analyses on gas transmission lines to determine the root cause of observed corrosion, leaks, ruptures or other forms of damage.